

# Grey-striped Francolin *Pternistis griseostriatus*: specimens, distribution and morphometrics

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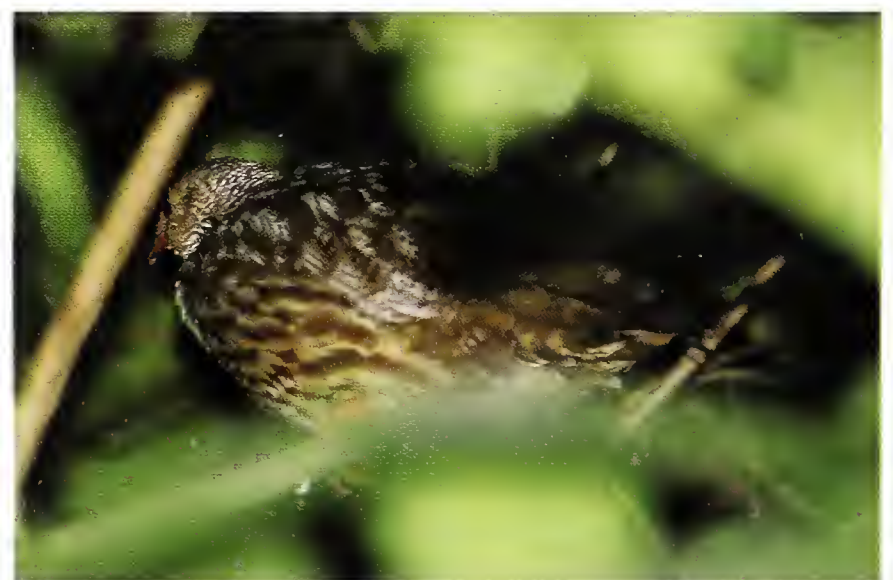
## Le Francolin à bandes grises *Pternistis griseostriatus* : spécimens, distribution et mensurations.

Le Francolin à bandes grises *Pternistis griseostriatus* est une espèce endémique à l'Angola et peu étudiée. Auparavant il n'était connu que de 25 spécimens et semblait comprendre deux populations distinctes. Les auteurs résument les informations sur 32 spécimens et leurs propres observations récentes, et présentent une carte de distribution des localités connues. Ces données montrent que l'espèce possède une répartition plus étendue qu'on ne le pensait précédemment, étant continue le long de l'escarpement de l'Angola, à environ 08–14°S. Les mensurations des spécimens des trois collections les plus importantes sont présentées. La comparaison du poids et de la taille des deux sexes révèle que les mâles sont bien plus grands que les femelles. Les données collectées ne confirment pas l'hypothèse que les populations méridionales sont plus grandes que celles du nord, comme il était postulé auparavant.

**Summary.** Grey-striped Francolin *Pternistis griseostriatus* is a poorly studied Angolan endemic. Previously it was known from 25 specimens, and appeared to comprise two distinct populations. Here we summarise information on 32 specimens and our own recent observations, and map the distribution of known localities. These data show that the species has a continuous range along the Angolan escarpment, at c.08–14°S, and a wider distribution than previously thought. We also summarise morphometric data for specimens in the three largest museum holdings, and compare male and female mass and size, demonstrating that males are significantly larger than females. However, our data do not support the hypothesis that southern populations are larger than northern populations, as was previously postulated.

**G**rey-striped Francolin *Pternistis griseostriatus* is a little-known, Near Threatened, Angolan endemic that occurs in densely vegetated habitats associated with the Angolan escarpment (Pinto 1983, Urban *et al.* 1986, Dean 2000, BirdLife International 2009) (Figs. 1a–b). What little was known of the species prior to 1975 was summarised by Pinto (1983) and Dean (2000), and no new data were obtained during the final

quarter of the 20th century (Dean 2000, Ryan *et al.* 2004). Since 2002 some additional data have improved our knowledge of the species' vocalisations, local abundance, distribution and behaviour (Vaz Pinto 2002, Ryan *et al.* 2004, Mills 2007, 2009, 2010, Mills & Dean 2007), although no comprehensive summary of museum specimens, other localities or morphometrics is available. Here we present a chronological



**Figure 1 a–b.** Grey-striped Francolin *Pternistis griseostriatus*, here photographed at night at its roost at Kumbira Forest in August 2006, is a little-known, Near Threatened, Angolan endemic (T. Dowd)

Francolin à bandes grises *Pternistis griseostriatus*, ici photographié la nuit à son dortoir dans la forêt de Kumbira en août 2006, est une espèce endémique à l'Angola peu connue et Quasi Menacée (T. Dowd)

**Table 1.** Chronological list of the 32 known specimens of Grey-striped Francolin *Pternistis griseostriatus* (excluding the specimen in the Instituto de Investigação Científica Tropical) plus three individuals captured by Vaz Pinto (2002), with morphometrics where these could be taken. Mass was taken from specimen labels where mentioned.

**Tableau 1.** Liste chronologique des 32 spécimens connus du Francolin à bandes grises *Pternistis griseostriatus* (à l'exclusion du spécimen venant de l'Instituto de Investigação Científica Tropical) plus trois individus capturés par Vaz Pinto (2002), avec les mensurations qui ont pu être prises. Le poids est celui mentionné sur l'étiquette du spécimen.

Date	Locality	Collector	Collection	Catalogue no.	Age	Sex	Mass (g)	Wing (mm)	Tail (mm)	Bill (mm)	Tarsus (mm)
Dec 1875	Quanza River	J. J. Monteiro	BMNH	1875.12.31.2	Ad.	M	-	160	75	27.5	43
Jul 1903	Pungo Andongo	W. J. Ansorge	AMNH	541412	Juv.	M	-	125	59	14.0	30
Dec 1903	Canhoca	W. J. Ansorge	AMNH	541414	Ad.	F	-	156	93	20.2	39
Aug 1904	Bongo River	W. J. Ansorge	AMNH	541413	Ad.	F	-	161	95	21.9	37
Aug 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.24	Ad.	M	-	161	83	28.3	47
Aug 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.26	Ad.	F	-	150	68	25.3	39
Sep 1908	N'dalatando	W. J. Ansorge	AMNH	541410	Ad.	F	-	153	85	20.9	37
Sep 1908	N'dalatando	W. J. Ansorge	AMNH	541411	Ad.	M	-	161	94	23.3	41
Sep 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.28	Ad.	F	-	159	70	26.5	41
Sep 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.27	Ad.	F	-	155	65	28.2	41
Oct 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.30	Ad.	F	-	151	65	26.3	40
Oct 1908	N'dalatando	W. J. Ansorge	BMNH	1910.5.6.29	Ad.	F	-	150	77	25.8	39
Oct 1930	Chingoroi	R. & L. Boulton	CMNH	108689	Ad.	F	-	-	-	-	-
Jan 1940	N'dalatando	R. H. Braun	AMNH	348799	Ad.	M	-	159	89	24.5	38
Jan 1955	Doñdo	G. Heinrich	FMNH	419131	Ad.	F	-	-	-	-	-
Jan 1955	Dondo	G. Heinrich	FMNH	419132	Ad.	M	-	-	-	-	-
Feb 1955	Dondo	G. Heinrich	ZMH	58.918	Ad.	M	-	-	-	-	-
Aug 1957	Calulo	G. Heinrich	YPM	50066	Ad.	F	-	-	-	-	-
Aug 1957	Calulo	G. Heinrich	YPM	50067	Ad.	F	-	-	-	-	-
Oct 1960	Camucuio	unknown	LBSC	2860	Ad.	F	-	-	-	-	-
Oct 1960	Camucuio	J. C. Cabral	LBSC	2861	Ad.	M	382	168	90	26.4	44
Jan 1961	Caxito	J. C. Cabral	LBSC	3201	Juv.	F	-	139	67	20.5	40
Jul 1966	Cachoeira	D. Maputo	LBSC	18211	Ad.	M	350	155	-	26.5	42
Jul 1966	Salinas	D. Maputo	LBSC	18255	Ad.	M	400	152	75	24.8	42
Jul 1966	Salinas	D. Maputo	LBSC	18274	Ad.	F	350	152	72	22.7	36
Sep 1970	Chingoroi	D. Maputo	LBSC	32346	Ad.	M	275	154	69	22.4	47
Sep 1970	Chingoroi	D. Maputo	LBSC	32350	Ad.	F	215	144	73	20.6	40
Jul 1971	Mumluga, 9 km south	M. Gouveia	LBSC	34346	Ad.	M	410	158	78	25.3	46
Oct 1971	Capira	L. Hangula	LBSC	35652	Ad.	F	213	141	-	22.5	41
Oct 1971	Capira	L. Hangula	LBSC	35653	Ad.	F	260	150	75	24.7	34
Oct 1971	Capira	A. M. Ferreira	LBSC	35728	Ad.	?	203	141	72	22.5	35
Oct 1971	Dolondolo	L. Hangula	LBSC	35709	Ad.	M	265	155	80	24.4	42
Aug 2001	Kawa Camp, Kissama NP	P. Vaz Pinto	Caught and released		Juv.	?	270	-	-	-	-
Aug 2001	Kawa Camp, Kissama NP	P. Vaz Pinto	Caught and released		Subad.	?	360	-	-	-	-
Aug 2001	Kawa Camp, Kissama NP	P. Vaz Pinto	Caught and released		Ad.	M	530	-	-	-	-

history of collecting, an updated summary of the species' distribution based on specimens and our own recent records, and a list of available measurements of specimens held in the three largest museum series'. SH measured specimens in the American Museum of Natural History, New York (AMNH), MSLM measured those in the Lubango Bird Skin Collection (LBSC) (Mills *et al.* 2010) and Hein van Grouw those in the Natural History Museum, Tring (BMNH).

### Collecting history

Dean (2000) summarised locality data for 25 specimens of Grey-striped Francolin, one of which is housed in the Centro de Zoologia of the Instituto de Investigação Científica Tropical, Lisbon, Portugal, but for which we have been unable to obtain details. Here we present information on eight further specimens: the type specimen and six other specimens in BMNH, and one additional specimen at the AMNH not listed in Dean (2000) (see Table 1).

**Table 2.** Recording localities of Grey-striped Francolin *Pternistis griseostriatus*, from north to south. Latitude and longitude are given in decimal degrees. Personal observations are followed by the year and month (for observations from more than one month, each month is listed). Numbers correspond to the localities in Fig. 2.

**Tableau 2.** Localities où le Francolin à bandes grises *Pternistis griseostriatus* a été observé ou collecté, du nord au sud. Latitude et longitude sont données en degrés décimaux. Les observations personnelles sont suivies de l'année et du mois (pour les observations faites sur plusieurs mois, chaque mois est mentionné). Les chiffres correspondent aux localités de la Fig. 2.

Locality (Province)	Lat (°S)	Long (°E)	Alt. (m)	Source and notes
01 = Quitexe, 10 km south (Kwanza Norte)	08.0184	15.0011	795	MSLM pers. obs. (2009–08)
02 = Caxito (Bengo)	08.5830	13.6576	15	Specimens
03 = Kissama National Park, Kawa Camp (Bengo)	09.1741	13.3641	10	MSLM pers. obs. (2005–08), Vaz Pinto (2002)
04 = Canhoca (Kwanza Norte)	09.2507	14.6828	330	Specimens
05 = N'dalatando (Kwanza Norte)	09.3015	14.9118	790	Specimens (locality previously called Salazar)
06 = Tombinga (Kwanza Norte)	09.3480	14.7949	480	MSLM pers. obs. (2009–08)
07 = Kissama National Park, south-east (Bengo)	09.6317	13.7585	180	MSLM pers. obs. (2005–08)
08 = Pungo Andongo (Malanje)	09.6697	15.5889	1,150	Specimens
09 = Dondo (Kwanza Norte)	09.6897	14.4244	50	Specimens
10 = Quitondo (Kwanza Sul)	09.7666	14.9000	600	Dean (2000), precise locality untraced
11 = Mumluga, 9 km south (Kwanza Sul)	09.9126	14.5371	435	Specimens (Mumluga not traced, but assumed to be halfway between Munenga and the Kwanza River)
12 = Calulo (Kwanza Sul)	09.9979	14.8930	995	Specimens
13 = Gabela, 25 km north (Kwanza Sul)	10.5856	14.2756	735	MSLM pers. obs. (2005–09)
14 = Salinas (Kwanza Sul)	10.9199	14.2640	280	Specimens
15 = Fazenda Maria Luisa (Kwanza Sul)	10.9268	14.3039	645	MSLM pers. obs. (2005–10)
16 = Assango-Gabela road (Kwanza Sul)	10.9311	14.3800	970	MSLM pers. obs. (2005–10)
17 = Fazenda Pregredior (Kwanza Sul)	10.9468	14.3457	780	MSLM pers. obs. (2005–09)
18 = Cachoeira (Kwanza Sul)	10.9894	14.0952	70	Specimens
19 = Conda, 15 km west (Kwanza Sul)	11.0690	14.2596	905	MSLM pers. obs. (2005–09)
20 = Bimbe (Kwanza Sul)	11.1071	14.2090	295	MSLM pers. obs. (2005–09, 2006–08, 2008–11, 2009–08)
21 = Kumbira Forest (Kwanza Sul)	11.1530	14.2800	875	MSLM pers. obs. (2005–08/09, 2006–08, 2008–11)
22 = Bango (Kwanza Sul)	11.3576	14.2083	1,060	MSLM pers. obs. (2005–10, 2009–08)
23 = Lower Gungu Road (Benguela)	11.7600	14.0809	295	MSLM pers. obs. (2005–10)
24 = Gungo (Benguela)	11.8109	14.1394	1,030	MSLM pers. obs. (2005–10)
25 = Namba Mountains (Kwanza Sul)	11.8439	14.7557	2,150	MSLM pers. obs. (2010–07)
26 = Canjala (Kwanza Sul)	11.9964	13.9957	50	W. Brock <i>in litt.</i> (2006–10)
27 = Bongo River (Benguela)	13.1606	14.3424	980	Specimens (precise locality unknown; Collar 1998)
28 = Chongoroi (Benguela)	13.5746	13.9420	670	Specimens
29 = Capira (Namibe)	13.7552	13.0586	565	Specimens
30 = Dolondolo (Namibe)	13.8166	13.1333	645	Specimens
31 = Camucuio (Namibe)	14.1152	13.2414	670	Specimens

The first specimen of Grey-striped Francolin was a male presented to the British Museum by R. B. Sharpe, collected on an unknown date prior to 31 December 1875 (the acquisition date) along the Kwanza (Quanza) River (Ogilvie-Grant & Sharpe 1896, Warren 1966), and not the Congo River as reported by Ogilvie-Grant (1890) in his type description. This specimen was perhaps taken by J. J. Monteiro, who collected along the Kwanza River during 1868–69 (W. R. J. Dean *in litt.* 2011). The precise locality is unknown, but it probably falls within the species' known range, somewhere along the Kwanza River between Dondo in the east and Kawa Camp,

Kissama National Park, in the west (Table 2). This specimen is housed at BMNH (Ogilvie-Grant 1893), along with six other specimens; an eighth specimen, not listed in Table 1, is currently missing (H. van Grouw *in litt.* 2010).

It was another 28 years before additional specimens were collected; between 1903 and 1908 W. J. Ansorge collected 11 individuals from the north of the species' range. These are housed at AMNH (Collar 1998) and BMNH, with five and six skins, respectively. Added to this series at AMNH is a sixth specimen collected by R. H. Braun in 1940, from N'dalatando (previously Salazar). In 1930 R. Boulton collected

a single specimen at Chingoroi, the first from the south of the species' range, which is held in the Carnegie Museum of Natural History, Pittsburgh (CMNH). Next, G. Heinrich collected five specimens, three in 1955, two of which were sent to the Field Museum of Natural History, Chicago (FMNH), and one to the Zoologisches Museum, Hamburg (ZMH), and two in 1957 which are housed in the Peabody Museum, Yale (YPM). Finally, between 1960 and 1971 various collectors at the Instituto de Investigação Científica de Angola (IICA) secured a series of 13 specimens from several scattered localities (Table 1), of which one is missing and 12 are now housed at LBSC. Thus a total of 32 specimens are currently traceable, excluding the destroyed Lisbon skin and the missing skins from BMNH and LBSC. There are no specimens in other museums contacted: the Museu Zoológico da Universidade de Coimbra (Carreira 1990), the Museum für Naturkunde, Berlin, the Museu Nacional de História Natural,

Lisbon, the Smithsonian Institution, Washington DC, the Gothenburg Natural History Museum, Gothenburg, and the Academy of Natural Sciences, Philadelphia.

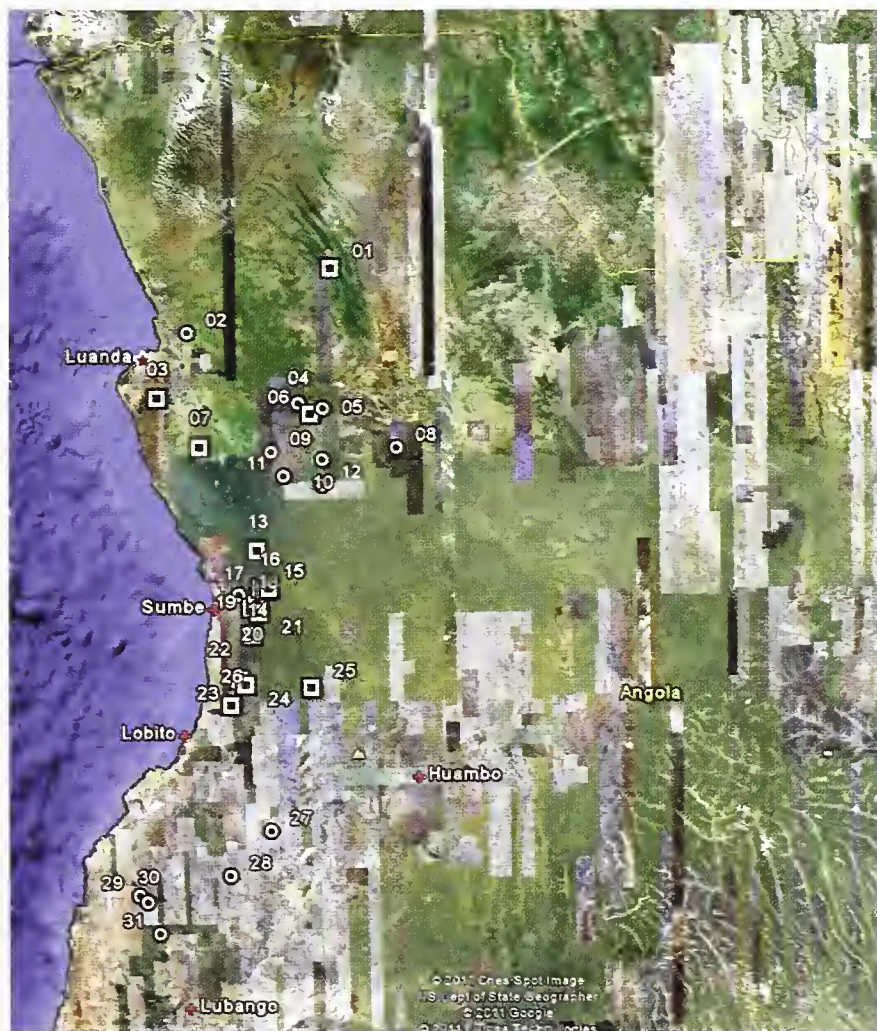
### Localities

The 32 specimens listed (Table 1) cover most of the species' current known range (Table 2; Fig. 2). However, there is a paucity of records from the centre of its distribution, with no specimens from between the Gabela area and the Bongo River, a distance of *c.*250 km, affording the impression that the species occurs in two isolated populations (Pinto 1983). However, recent records from various localities between Gabela and Gungo demonstrate that the species occurs continuously along the scarp at least as far as the Kwanza Sul / Benguela provincial border (Mills & Dean 2007, Mills 2010). The *c.*140-km stretch of scarp between Gungo and the Bongo River has not been surveyed, but the species probably occurs wherever suitable habitat exists, especially in the Canjala / Egito area, where several other scarp endemics have been collected (Mills & Dean 2007). In September 2006 W. Brock purchased a live Grey-striped Francolin on the roadside near Canjala, which had been acquired in gallery forest nearby (PVP). Recent records from near Quitexe on the Kwanza Norte / Uige provincial border and in the Namba Mountains of southern Kwanza Sul (Mills *et al.* submitted) extend the known range north and east (Fig. 2): These records reveal that the species has a range of *c.*45,000 km<sup>2</sup> (Mills 2010), larger than the 17,300 km<sup>2</sup> estimated by BirdLife International (2009).

Most of the localities from which records are available are sited on or adjacent to the Angolan scarp, and range in altitude from sea level to 1,150 m. The only exceptions are Pungo Andongo, east of the scarp on the Angolan plateau, the high Namba Mountains in the Angolan central highlands, from where there is a record at over 2,000 m (Mills *et al.* submitted), and localities on or near the Serra da Neve (Capira, Dolondolo, Camucuio), an isolated mountain on the coastal plain, which rises to over 1,700 m.

### Morphometrics

The only published morphometrics for Grey-striped Francolin are in Pinto (1983) and Urban *et al.* (1986), with mass given for three birds



**Figure 2.** Google Earth image showing all known Grey-striped Francolin *Pternistis griseostriatus* localities. Specimen localities are denoted using squares and observations with circles. Refer to Table 2 for details of each locality.

Image de Google Earth montrant toutes les localités connues du Francolin à bandes grises *Pternistis griseostriatus*. Les carrés représentent des spécimens ; les cercles des observations. Se référer au Tableau 2 pour les détails concernant chaque localité.

by Vaz Pinto (2002). Here we present data from 23 birds; 20 specimens and three captured birds (Table 1). It should be kept in mind that some individual differences may exist in the way measurements were taken, although we attempted to standardise these as far as possible. Measurements were obtained as follows: mass was taken from specimen labels or as published; wing and tail length to the nearest 1.0 mm using a standard wing rule; bill length to the nearest 0.1 mm and tarsus length to the nearest 1.0 mm with vernier callipers. These measurements were taken as follows: wing length (flattened), from the carpal joint to the tip of the longest primary; tail length, from the base to the tip of the central rectrix; tarsus length, from the tibiotarsus joint to the distal end of the tarsometatarsus; and bill (maxilla) length, from where the culmen enters the feathers of the head to the tip of the bill.

One-tailed student t-tests (Zar 1999) were used to test whether males are, on average, larger and heavier than females, as is the case in many other members of the genus (Hockey *et al.* 2005). We also tested whether southern populations (south of 12°S) are larger and heavier than northern populations, as suggested by Pinto (1983).

Mass of adult males ( $n = 7$ ) was significantly greater than that of adult females ( $n = 4$ ) ( $t = 2.203$ , d.f. = 9,  $P < 0.05$ ), with mean adult male mass (265–373–530 g) (min.–mean–max.) greater than that of the heaviest adult female (213–260–350 g); all birds ( $n = 14$ ): 213–320–530 g. Adult males ( $n = 9$ ) also had significantly longer wings than adult females ( $n = 12$ ) ( $t = 2.664$ , d.f. = 19,  $P < 0.01$ ), although there was some overlap; adult males: 152–158–168 mm; adult females: 141–151–161 mm. No difference could be detected in tail length between the sexes ( $t = 1.348$ , d.f. = 17,  $P < 0.10$ ), although this may be due the small sample size or difficulties associated with inconsistent measuring techniques; adult males: 69–82–94 mm; adult females: 65–76–95 mm. However, adult males do possess significantly longer tarsi than adult females ( $t = 3.977$ , d.f. = 19,  $P < 0.0005$ ); adult males: 38–43–47 mm; adult females 34–38–41 mm.

Our data do not support the hypothesis that southern birds are larger than northern birds. There was no difference between northern and southern birds in wing or tarsus length for males, females or all birds combined ( $P > 0.5$ ;

**Table 3.** Mean wing length, tarsus length and mass for male, female and all birds from northerly and southerly (south of 12°S) populations, with sample sizes in parentheses, followed by the significance level ( $P$ ) of the t-test for differences. An asterisk denotes a significant difference at the 0.05 significance level.

**Tableau 3.** Longueur moyenne de l'aile et du tarse et poids moyen pour le mâle, la femelle et tous les oiseaux des populations du nord et du sud (au sud de 12°S), avec la taille de l'échantillon entre parenthèses, suivi par le degré de signativité ( $P$ ) du test de Student pour les différences. Un astérisque indique une différence significative.

	North	South	$P$
Wing length: males	157.7 (6)	159.0 (3)	0.362
Wing length: females	153.3 (8)	149.0 (4)	0.119
Wing length: all	155.5 (15)	152.0 (8)	0.102
Tarsus length: males	42.7 (6)	44.0 (3)	0.237
Tarsus length: females	39.4 (9)	37.0 (5)	0.082
Tarsus length: all	40.7 (15)	40.0 (8)	0.322
Mass: males	422.5 (4)	307.0 (3)	0.045*
Mass: females	350 (1)	229.3 (3)	N/A
Mass: all	408.0 (5)	259.0 (7)	0.002*

Table 3), although northern males and all birds combined were significantly heavier than their southern counterparts, *contra* the suggestion of Pinto (1983). However, since mass was taken from specimen labels, the accuracy of and means for measuring mass being unknown, and no body size differences were detected, we believe these differences in mass may be spurious. Nonetheless, it should also be noted that comparing small datasets for this character can be notoriously unreliable (e.g., Vuilleumeier 1999).

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